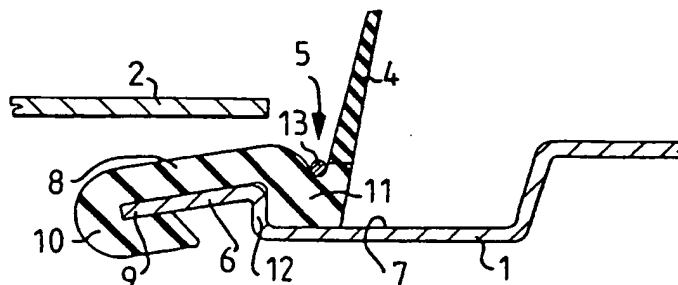




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: SEALING ELEMENT FOR A JOINT BETWEEN A PIPE AND CONNECTOR, AND A METHOD FOR PROVIDING SUCH SEALING



## (57) Abstract

A circumferential, strip-like, joint-sealing element (5) and method of producing such element, being disposed on one end of an extension piece (1) sealed to a tubular element (2). The sealing element is a rubber element presenting in cross section a foot-part (8), anchoring the element to a free end-edge (9) of the extension piece, and having a toe-part (10) gripping around the end-edge and a heel-part (11) resting on bottom of a channel (7) inwardly of said end-edge, while abutting a forward channel side-wall (12). The sealing element has a sealing-lip (4) projecting outwardly from the heel-part (11) and abutting the tubular element inner surface. The foot-part has retention means, e.g. a wire on the sealing element outer surface. Alternatively, said means is a glue under the foot-part to hold same firmly to the extension piece outer surface. The end surfaces of the strip-like element are brought into end-to-end abutment without inducing elastic tension in the element.

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SEALING ELEMENT FOR A JOINT BETWEEN A PIPE AND CONNECTOR,  
AND A METHOD FOR PROVIDING SUCH SEALING.

- 5     The present invention relates to a circumferentially  
extending joint-sealing element according to the preamble  
of Claim 1, and to a method of producing a circumferential  
joint-seal in accordance with the preamble of Claim 5.
- 10    A circumferential joint-sealing element of the kind in  
question is disposed on the end of an extension piece or a  
connector, such as a pipe extension or a tubular channel  
extension which is to be joined sealingly to another  
tubular element, such as a pipe or channelling, the exten-  
15    sion piece having a relatively shallow channel extending  
circumferentially inwardly of its free end-edge.

There is a great need in ventilation techniques and in  
air-processing installations for a method which will  
20    enable tubular channelling or pipes to be joined together  
in a simple and reliable fashion, and which will also  
enable various types of apparatus (such as air supply and  
air exhaust terminal devices) to be connected sealingly to  
such channeling or pipes.

- 25    Such sealing joints, connections and the like between  
mutually coacting pipes or channels, in which one end of a  
first pipe or channel is inserted slightly into the end of  
an adjacent, second pipe or channel of somewhat larger  
30    cross-section dimension than said first pipe or channel,  
are often achieved with the aid of a circumferential ring  
seal mounted adjacent the end of the pipe or channel  
having the smaller dimension. Normally, such a ring seal  
comprises at least one radially projecting, elastic bead  
35    or elastic sealing lip, which can be respectively com-

pressed together radially inwards or bent down into sealing abutment with the inner surface of the end part of the connecting pipe or channel having the larger dimension.

- 5 The object of the present invention is to provide a novel type of circumferential (i.e. disposed in the form of a ring) joint-sealing element which is constructionally simple, which can be fitted readily to the end of the extension piece concerned, which will remain positively  
10 seated in its intended fitting and functional position while pushing the jointed pipe elements together and when pulling said pipe elements apart. The joint-sealing element shall also provide a good sealing effect in its functional position and shall be cheap to manufacture and  
15 to fit onto the end of the extension piece. In addition, the joint-sealing element shall be such that prior to being fitted, the sealing element does not constitute an endless, closed annular sealing element, but that this configuration is, instead, achieved in conjunction with  
20 fitting said element, said element being formed from a continuous strip-like rubber profiled-element from which a suitable length is taken in conjunction with fitting the seal to one end of the extension piece or connector.
- 25 This object is achieved with a joint-sealing element of the kind set forth in the preamble of Claim 1, in that the sealing element is a strip-like, elastic profiled element, e.g. a rubber element, which presents in cross-section a foot-part by means of which the profiled element is an-  
30 chored to the free end-edge of the extension piece, said foot-part having a forward, U-shaped rearwardly bent toe part which grips around the end-edge of said extension piece, and said cross-

section also presenting a rearwardly located heel-part which is disposed on the bottom of the channel at the forward part of said channel, in abutment with the forward side wall of said channel, and a sealing-lip part which projects from the rearward part of said foot-part and which is made of a softer material than said foot-part, said sealing-lip part being intended for sealing abutment with the other defining surface of said tubular element or pipe, and in that the foot-part is provided with retention means which function to hold said foot-part in abutment with the outer surface of the extension piece.

Because of the forwardly located, U-shaped and rearwardly bent toe part of said foot-part, said toe part gripping around the end-edge of the extension piece, it is ensured that the sealing element will not be displaced axially in the shallow channel when the extension piece is pushed into the end of the surrounding pipe, against the inner surface of which the sealing lip part comes into abutment and provides the desired sealing effect.

In turn, the rearwardly located heel-part of said foot-part, due to abutment of said heel part with the forward side-edge wall of the channel, it is ensured that the sealing element will not be drawn loose from the end of the extension piece as said extension piece is withdrawn from the end-part of the surrounding pipe, when the two pipes or channels joined together are again separated from one another.

30

Because the sealing-lip part is manufactured from a softer material than the foot-part, anchoring of the foot-part at one end of the extension piece will be highly effective,

at the same time as the sealing-lip part, due to its greater elasticity, will provide an optimum sealing effect against the inner surface of the surrounding pipe or channel.

5

Because of the presence of the retention means on the foot-part, the profiled element need not consist of a preformed ring sealing element (endless) but that the profiled element can, instead, consist of a suitable  
10 length of a profiled element whose both end surfaces will, admittedly, come into abutment with one another when the joint-sealing element is fitted to one end of the extension piece but which need not be joined together by, e.g., vulcanization.

15

For instance, the retention means may consist of a retaining wire (see Claim 2) or may have the form of an adhesive (see Claim 3), such as glue.

20 In order for the sealing element to provide the best sealing effect possible against the inner surface of the surrounding pipe or like tubular element, the two mutually adjacent end regions of the sealing-lip part should overlap one another at the position on the circumference of  
25 the extension piece at which the two end surfaces of the foot-part are in end-to-end abutment. This is achieved with a joint-sealing element having the features set forth in the characterizing clause of Claim 4.

30 The procedural advantages associated with the aforesaid inventive object are achieved with a method of the kind set forth in the preamble of Claim 5 and characterized by the following steps:

- A. Forming a sealing element from a continuous strip-like, elastic profiled element, e.g. a rubber element, which, in cross-section, presents a foot-part made of a relatively hard, elastic material, and a sealing-lip part which projects outwardly from a rearwardly located heel-part of the foot-part and is made of a relatively soft, elastic material.
- 5
- B. Taking from the continuous strip-like profiled element a profiled-element length which corresponds to the circumferential dimension of the tubular extension piece.
- 10
- C. Placing the thus obtained profiled-element length around the edge of the extension piece such that a rearwardly bent toe-part of said foot-part is anchored over the free end-edge of the extension piece, said toe-part having a U-shaped cross-section, while the heel-part is placed on the bottom of the channel at its forward part and in abutment with the forwardly located channel defining surface.
- 15
- 20
- D. Bringing the mutually parallel end-surfaces of the free-ends of said profiled-element length into mutual end-to-end abutment without generating elastic tension in the profiled element.
- 25
- E. Applying a retention means to the profiled-element length so as to retain said profiled element length in its intended position on the outside of the extension piece.
- 30

The circumferential joint-seal thus obtained affords, inter alia, the advantage that there is no need to keep a

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large number of different sized joint-sealing elements in store to suit all dimensions of extension pieces that need fitting with this kind of joint-sealing element.

5 The sealing element required for a given extension piece is, instead, formed directly on the extension piece itself, by cutting from a stored length of the strip-like profiled element a length which corresponds to the circumferential dimension of the extension piece concerned, said  
10 storage length being many times greater than the length required to produce the joint seal in question. A joint seal whose size corresponds exactly to the extension piece concerned can be readily produced when practicing the inventive method. Thus, the requisite length of profiled-  
15 element is produced at the time of forming the joint seal at the end of the extension piece.

Various retention means can be used; two such means are defined in Claims 6 and 7, although other means or a  
20 combination of these means can be used.

The invention will now be described in more detail with reference to an exemplifying embodiment of an inventive joint-sealing element illustrated in the accompanying  
25 drawings, in which

Figure 1 is an axial sectional view through the end-parts of two tubular channel elements which are to be joined sealingly together with the aid of an inventive sealing  
30 element;

Figure 2 illustrates in larger scale that part of the channel elements contained within the oval II in Figure 1;



Figure 3 is a sectional view corresponding to the view of Figure 2, but illustrates the channel elements subsequent to having pushed the part fitted with the sealing element into a surrounding channel element;

5

Figure 4 illustrates the situation in which withdrawal of the channel element to which the sealing element is fitted from the surrounding channel element has commenced; and

10

Figure 5, finally, is a spread-view, from above, of the region in which the two end surfaces of the foot-part of said profiled-element length lie in end-to-end abutment.

15

Figure 1 illustrates the situation which prevails when an extension piece or tubular connector 1 is to be connected sealingly to a pipe 2, by inserting the left end of the extension piece 1, fitted with a circumferential, inventive seal 3, slightly into the right-hand end of the pipe 2, the internal diameter of which is somewhat larger than the outer diameter of the extension piece 1. Thus, the joint is produced by pushing the extension piece 1 into the pipe 2 (in the direction of the arrow A) to an extent such that the sealing-lip part 4 of the seal 3 will come into sealing abutment with the inner surface of the pipe 2, as illustrated in larger scale in Figure 3.

20

25

As illustrated in the larger scale illustrations of Figures 2-4, the annular seal 3 comprises a sealing element 5 which is fitted to the conical end-part 6 of the extension piece 1, which has a relatively shallow circumferential channel 7 provided immediately inwardly of the end-part 6.

30

The sealing element 5 comprises a strip-like profiled-element length which is disposed in the form of a ring around the end-part 6 and in the forward part of the channel 7. When seen in cross-section, this profiled  
5 element 5 presents a foot-part 8, by means of which said profiled element is anchored to the conical end-part 6, a sealing-lip part 4 which in an unloaded state extends outwardly and upwardly from the rear part of said foot-part 8 and which is made of a softer material than said  
10 foot-part. Although the foot-part and sealing-lip part 4 will preferably be made of rubber of mutually different hardnesses, it is conceivable that said parts may also be formed from plastics materials having appropriate elastic properties.

15 The forwardly located portion of the foot-part 8 is configured as a toe-part 10 which grips around the end-edge 9 of the end-part 6 and which is bent rearwardly in a U-shape slightly in beneath the edge of the end-part 6. The  
20 rearwardly located portion of the foot-part 8 is configured as a heel-part 11 which is placed on the bottom of the channel 7 at the forward part thereof, the front part of said heel-part 11 supporting against the forwardly located side-wall 12 of the  
25 channel 7.

For the purpose of retaining the sealing element 5 in the illustrated, functional position (see Figure 3) at the end-part 6, the foot-part 8 is provided with retention  
30 means in the form of a retaining wire or thread 13 mounted on the upper side of the profiled element at the junction between the rearwardly located portion of the foot-part 8 and the sealing-lip part 4. The wire, or thread 13, may be

made of metal, textile, plastics or like material. Alternatively, the retention means may consist of a glue joint between the outer surface of the conical end-part 6 and the undersurface of the area of the foot-part in abutment with said-part, i.e. the area between the end-edge 9 and the heel-part 11. In those instances when the retention means has the form of a thread or wire 13, the ends of the thread or wire may be appropriately joined together, for instance by knotting or welding said ends together, or in some other way.

The profiled element length from which the sealing element is formed is thus placed in the form of a ring around the conical end-part 6 and positioned in the forwardly located part of the channel 7. The two ends of the profiled-element length are brought into face-to-face abutment with one another at a location on the circumference of the extension piece 1, as illustrated in the spread view of Figure 5. At this abutment location (in the centre of Figure 5), the mutually parallel and abutting end-surfaces of the foot-part 8 lie in the contact plane B shown in Figure 5, this plane extending perpendicularly to the longitudinal edge 14 of the profiled-element length. The sealing-lip part 4, on the other hand, has end surfaces 15 and 15' respectively which project obliquely outwards from said plane B in mutually opposite directions, which means that the sealing-lip part 4 will overlap on itself within a triangular region C located between said end-surfaces 15 and 15'. Thus, the overlapping end-regions of the sealing-lip part can move mutually by virtue of the fact that they are able to slide on one another in the overlapping region C. This enables the sealing-lip part 4 to provide a good sealing effect against a surrounding pipe or like tubular

element, even should the sealing-lip part 4 have varying degrees of crookedness. This crookedness or sloping of the sealing-lip part 4 in its sealing position is quite natural, inter alia, because of the differences in diameter  
5 between the pipe 2 and the extension piece 1, or as a result of the free height of the channel 7, calculated from the bottom of the channel to the inner surface of the pipe 2. This free height cannot always be predetermined with any high degree of accuracy, and hence the ability of  
10 the sealing-lip part 4 to "accept" certain variations in dimensions without impairing the sealing effect is of significant importance.

Claims

1. A circumferential joint-sealing element (5) disposed on the end of an extension piece or connector (1), such as  
5 a pipe extension or a channel-part extension to be joined sealingly to a pipe or channel (2), said extension piece having a circumferentially extending, relatively shallow channel (7) provided inwardly of its free end-edge, c h a  
r a c t e r i z e d in that the sealing element (5)  
10 comprises a strip-like, elastic profiled element, e.g. a rubber element, which presents in cross-section a foot-part (8) by means of which the profiled element is anchored to the free end-edge of the extension piece (1) and which foot-part has a forwardly located, U-shaped, rear-  
15 wardly bent toe-part (10) which functions to grip around the end-edge (9) of the extension piece, and further presents a rearwardly located heel-part (11) which is placed on the bottom of the channel (7) at the forward part thereof in abutment with the forward side-wall (12)  
20 of the channel (7), and further presents a sealing-lip part (4) which projects outwardly from the rearward part of the foot-part and which is made of a softer material than said foot-part, said sealing-lip part being intended to abut sealingly with the defining surface of said pipe-part or channel-part (2); and in that the foot-part (8) is  
25 provided with retention means (e.g. 13) by means of which the foot-part is held in abutment with the outer surface of the extension piece.
- 30 2. A sealing element according to Claim 1, c h a r - a c t e r i z e d in that the retention means comprises a circumferentially extending retaining wire or thread (13) which is mounted on the upper side of the profiled element

(5) at the junction between the rearward portion of the foot-part (8) and the sealing-lip part (4).

5 3. A sealing element according to Claim 1, c h a r -  
a c t e r i z e d in that the retention means comprises a  
binding agent, e.g. glue, disposed between the outer  
surface of the end-part (6) of said extension piece and at  
least one surface area of the foot-part (8) of said pro-  
10 filed-element length in abutment with said end-part (6).

4. A sealing element according to any one of Claims  
1-3, c h a r a c t e r i z e d in that the sealing  
element (5) comprises a profiled-element length which is  
15 placed to form a ring around the edge of the extension  
piece, the two end surfaces of the foot-part (8) at the  
ends of said length forming mutually parallel and mutually  
abutting end surfaces (at B), whereas the end surfaces (15,  
15') of the sealing-lip part (4) extending outwardly from  
20 said end surfaces extend obliquely inwards over/under one  
another, such that the mutually adjacent end-regions of  
the sealing-lip part overlap one another at the relevant  
location on the circumference of the extension piece and  
are able to move mutually in said overlapping region (C).

25 5. A method of producing a circumferential joint-seal (3)  
in the vicinity of the end of an extension piece (1), e.g.  
at the end of a tubular piece or a channel element to be  
connected (jointed) sealingly to a further tubular piece  
or channel part (2), and in which the extension piece has  
30 a circumferentially extending, relatively shallow channel  
(7) provided inwardly of its free edge, c h a r a c t e r  
i z e d by forming the sealing element from a strip-like,

elastic profiled element, e.g. a rubber element, which presents a foot-part (8) made of a relatively hard, elastic material, a sealing-lip part (4) which projects from a rearwardly located heel-part (11) of the foot-part (8) and  
5 is made of a relatively soft, elastic material; producing from said profiled element a profiled-element length which corresponds to the circumferential dimension of the extension piece; placing said profiled-element length around the edge of the extension piece such that a rearwardly-  
10 bent toe-part (10), of U-shaped cross section, of said foot-part (8) is anchored over the free end-edge (9) of the extension piece, whereas the heel-part (11) is located on the bottom of the channel (7) at the forwardly located part thereof in abutment with the forward defining surface  
15 of said channel; bringing the mutually parallel end surfaces of the free-ends of the profiled-element length into end-to-end abutment with one another (at B) without placing the profiled-element length under elastic tension; and by applying retention means to the profiled-  
20 element length such as to retain said length in its intended position on the outside of the extension piece.

6. A method according to Claim 5, c h a r a c -  
25 t e r i z e d in that the retention means is a retaining wire or thread (13) mounted on the outside of the profiled-element length at the junction between the rearwardly located portion of the foot-part (8) and the sealing-lip part (4); and in that the two free ends of the  
30 thread or wire are joined together, for instance by knotting, welding or in some other manner.

7. A method according to Claim 5, c h a r a c -  
t e r i z e d in that the retention means is a binding  
agent, e.g. glue, which is applied between the outer  
surface of the end-part (6) of the extension piece and a  
5 surface area of the foot-part (8) of said profiled-element  
length in abutment with said end-part (6).

8. A method according to any one of Claims 5-7,  
c h a r a c t e r i z e d by cutting the profiled-  
10 element length in a manner such that the two end surfaces  
of the foot-part (8) form end surfaces (at B) extend  
perpendicularly to the longitudinal direction of the  
profiled element, whereas the two end surfaces  
(15, 15') of the sealing-lip part (4) form surfaces which  
15 extend obliquely outwardly from respective adjoining foot-  
part end surfaces, such that the mutually adjacent end-  
regions of the sealing-lip part will overlap one another  
when the end surfaces of the foot-part are brought into  
end-to-end abutment with one another.



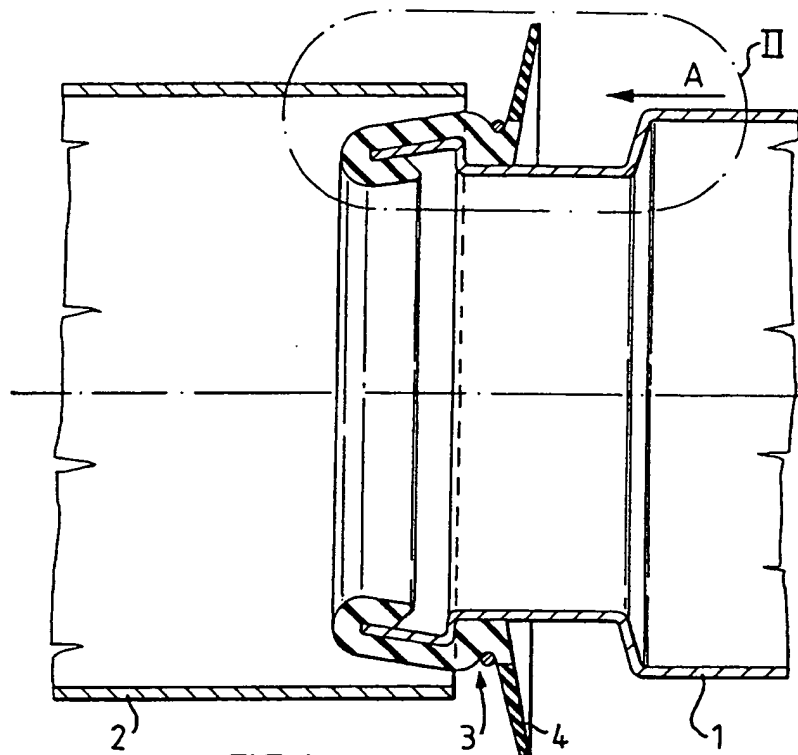


FIG. 1

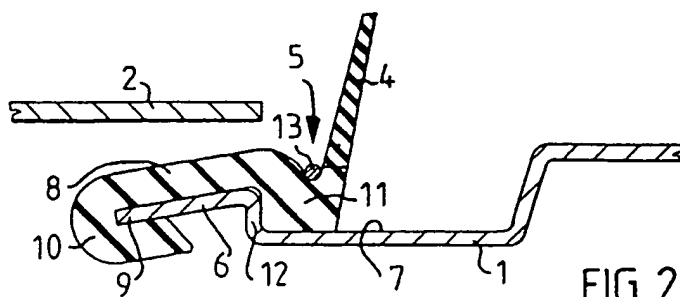


FIG. 2

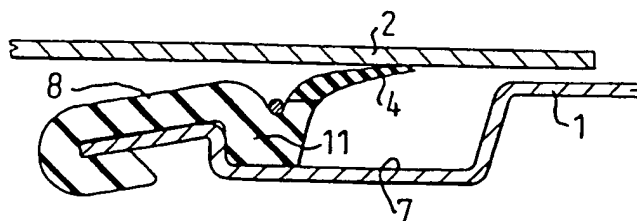


FIG. 3

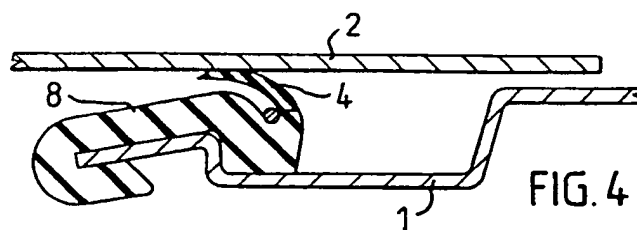


FIG. 4

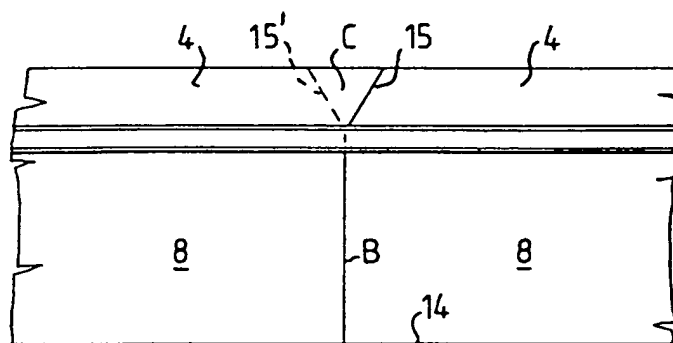


FIG. 5

# INTERNATIONAL SEARCH REPORT

International Application No PCT/SE 90/00349

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) <sup>6</sup> According to International Patent Classification (IPC) or to both National Classification and IPC IPC5: F 16 L 21/035																	
<b>II. FIELDS SEARCHED</b> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Minimum Documentation Searched<sup>7</sup></div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%; border-bottom: 1px solid black;">Classification System</td> <td style="border-bottom: 1px solid black;">Classification Symbols</td> </tr> <tr> <td style="height: 40px; vertical-align: bottom;">IPC5</td> <td style="vertical-align: bottom;">F 16 L</td> </tr> </table> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched<sup>8</sup></div> <p>SE,DK,FI,NO classes as above</p>			Classification System	Classification Symbols	IPC5	F 16 L											
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IPC5	F 16 L																
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 10%; border-bottom: 1px solid black;">Category *</th> <th style="width: 70%; border-bottom: 1px solid black;">Citation of Document,<sup>11</sup> with indication, where appropriate, of the relevant passages<sup>12</sup></th> <th style="width: 20%; border-bottom: 1px solid black;">Relevant to Claim No.<sup>13</sup></th> </tr> <tr> <td style="vertical-align: top;">A</td> <td>SE, B, 382675 (LINDAB, LINDHS INDUSTRI AB) 9 February 1976, see the whole document --</td> <td></td> </tr> <tr> <td style="vertical-align: top;">A</td> <td>EP, A1, 0124678 (SCHNALLINGER, H.M.) 14 November 1984, see the whole document --</td> <td></td> </tr> <tr> <td style="vertical-align: top;">A</td> <td>US, A, 3400954 (J.L. BROWN) 10 September 1968, see the whole document --</td> <td></td> </tr> <tr> <td style="vertical-align: top;">A</td> <td>US, A, 3955834 (AHLROT) 11 May 1976, see the whole document --  -----</td> <td></td> </tr> </table>			Category *	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>	A	SE, B, 382675 (LINDAB, LINDHS INDUSTRI AB) 9 February 1976, see the whole document --		A	EP, A1, 0124678 (SCHNALLINGER, H.M.) 14 November 1984, see the whole document --		A	US, A, 3400954 (J.L. BROWN) 10 September 1968, see the whole document --		A	US, A, 3955834 (AHLROT) 11 May 1976, see the whole document --  -----	
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A	US, A, 3955834 (AHLROT) 11 May 1976, see the whole document --  -----																
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><sup>a</sup> Special categories of cited documents: <sup>10</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p> </div> </div>																	
<b>IV. CERTIFICATION</b> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-bottom: 1px solid black;">Date of the Actual Completion of the International Search</td> <td style="width: 50%; border-bottom: 1px solid black;">Date of Mailing of this International Search Report</td> </tr> <tr> <td style="height: 30px; vertical-align: bottom;">25th July 1990</td> <td style="vertical-align: bottom; text-align: center;">1990 -08- 1 6</td> </tr> <tr> <td style="border-bottom: 1px solid black;">International Searching Authority</td> <td style="border-bottom: 1px solid black;">Signature of Authorized Officer</td> </tr> <tr> <td style="text-align: center; height: 40px;">SWEDISH PATENT OFFICE</td> <td style="vertical-align: bottom;">Axel Lindhult </td> </tr> </table>			Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	25th July 1990	1990 -08- 1 6	International Searching Authority	Signature of Authorized Officer	SWEDISH PATENT OFFICE	Axel Lindhult							
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**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO. PCT/SE 90/00349**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the Swedish Patent Office EDP file on 90-06-27. The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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